

9. (Amended) The sensor according to claim 1, wherein the second electrode is in a reference duct and wherein the reference duct is situated between the at least one first electrode and the at least one heating element.
12. (Amended) The sensor according to claim 1, wherein a portion of the second electrode extends over the width of a reference duct and additionally acts as a shield against any coupling of heater voltage U_H and wherein the reference duct is situated between the at least one first electrode and the at least one heating element.

REMARKS

Reconsideration of the application is respectfully requested in view of the preceding amendments and for the following reasons.

Rejection under 35 U.S.C. §112, second paragraph, with respect to Claims 2-4, 9 and 12

Claims 2-4, 9 and 12 were rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In support of the rejection, the Examiner has stated that "Claim 2 does not specify what the negative operating voltage is utilized for with respect to claim 1." The Applicant has amended claim 2, as suggested by the Examiner.

In claim 4 it was unclear to the Examiner "what is meant by the circuit arrangement "analyzing a negative probe voltage"." The Applicant has appropriately amended claim 4 to overcome this rejection.

In claims 9 and 12 the presence of a reference duct had not been sufficiently defined. The Applicant has appropriately amended claims 9 and 12 to overcome this rejection.

Withdrawal of the rejection under 35 U.S.C. §112, second paragraph, is hereby respectfully requested.

Rejection under 35 U.S. C. § 103 (a) with respect to claims 1 and 5-13

Claims 1 and 5-13 have been rejected under 35 U.S.C. § 103(a), the Patent Office has contended that these claims are unpatentable over Kato et al (U.S. Patent No. 4,909,922). It is respectfully submitted that this rejection should be withdrawn for the following reasons.

In order for a claim to be rejected for obviousness under 35 U.S.C. § 103(a), not only must the prior art teach or suggest each element of the claim, the prior art must also suggest combining the elements in the manner contemplated by the claim. See Northern Telecom, Inc. v. Datapoint Corp., 908 F. 2d 931, 934 (Fed. Cir. 1990), cert. denied 111 S.Ct. 296 (1990); In re Bond, 910 F. 2d 831, 834 (Fed. Cir. 1990). The Examiner bears the initial burden of establishing a *prima facie* case of obviousness. See M.P.E.P. §2142. To establish a *prima facie* case of obviousness, the Examiner must show, *inter alia*, that there is some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify or combine the references and that, when so modified or combined, the prior art teaches or suggests all of the claim limitations. See M.P.E.P. §2143. Applicant respectfully submits that neither of these criteria for obviousness are met here.

Applicant's invention in one aspect is an electrochemical sensor comprising: a solid electrolyte element including at least one first electrode, at least one second electrode and at least one heating element, the at least one second electrode being situated closer than the at least one first electrode to the at least one heating element, the at least one second electrode being coupled to ground, the at least one first electrode coating with the at least one second electrode and being negatively polarized. With this arrangement a negative operating voltage is provided to the electrochemical sensor.

Kato on the other hand is directed to an oxygen sensor 10, with a built-in heater 36. However, there is no teaching and/or disclosure in Kato to have the at least one second electrode 13 having ~~a positive voltage~~ and being coupled to the ground, as disclosed and claimed by the Applicant, because in Kato's Figure 7 the second or reference electrode 24 is not grounded and there is no suggestion in Kato to ground the second or the reference electrode 24.

Similarly, there is no teaching and/or disclosure in Kato to have the at least one

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and not
old

no
positive
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claimed

first electrode 12 being negatively polarized and coacting with the at least one second electrode 13, as disclosed and claimed by the Applicant, because in Kato's Figure 7 the first or measuring electrode 22 is not coacting with the at least one second or reference electrode 24 and there is no suggestion in Kato to have the first or measuring electrode 22 to coact with the at least one second or reference electrode 24. Furthermore, in Kato's Figure 7, the at least one second or reference electrode 24 actually coacts with the heat generating portion 36, via a conductor path 46 between electrical lead 38b and the lead for the reference or second electrode 24.

electrode
of Kato
would
be negatively
polarized
by emf

In fact, Kato teaches away from applicant's invention when he connects the heating element 36, to the reference electrode 24, via the conductor path 46, as more clearly shown in Figure 7. Whereas, the Applicant is disclosing and claiming that the first or the measurement electrode 12, be electrically connected to the second or the reference electrode 13, with the second or the reference electrode 13 having a positive voltage and being connected to the ground.

Claims 5-12, are dependent on Claim 1, and as such are patentable, as claim 1 is clearly patentable.

For the reasons discussed above, withdrawal of the rejection under 35 U.S.C. §103 (a), with respect to claims 1 and 5-13, is hereby respectfully requested.

Rejection under 35 U.S. C. § 103 (a) with respect to claims 2-4

Claims 2-4, have been rejected under 35 U.S.C. §103(a), the Patent Office has contended that these claims are unpatentable over Kato (U.S. Patent No. 4,909,922) in view of Logothetis et al ("High-temperature Oxygen Sensors", ACS Symposium Series). It is respectfully submitted that this rejection should be withdrawn for the following reasons.

The earlier discussion with reference to Kato in connection with claim 1 is applicable here since claims 2-4 are dependent on claim 1. Furthermore, the criteria to be applied in obviousness rulings is also incorporated herein by reference,

Logothetis discloses high temperature oxygen sensors based on electrochemical oxygen pumping, as more clearly shown with reference to Figures 1 and 2. However, there is no teaching and/or disclosure in Logothetis to have the at least one second

Logothetis
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to teach
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electrode 13 having a positive voltage and being coupled to the ground, as disclosed and claimed by the Applicant, because in Logothetis' Figure 2 the electrode is not grounded and there is no suggestion in Logothetis to ground the electrode.

Similarly, there is no teaching and/or disclosure in Logothetis to have the at least one first electrode being negatively polarized and coacting with the at least one second electrode, as disclosed and claimed by the Applicant, because in Logothetis in Figure 2 the electrodes are both connected to an external voltage V for transferring oxygen from one side to the other.

Furthermore, Logothetis teaches away from applicant's invention when he applies the external voltage V to the platinum electrodes via a load resistor R_L . He needs this arrangement to apply the voltage V across the ZrO_2 cell to transfer oxygen from one side to the other side of the cell, as more clearly discussed with reference to his Figure 2. Whereas, the Applicant is disclosing and claiming that the first or the measurement electrode 12, be electrically connected to the second or the reference electrode 13, with the second or the reference electrode 13 having a positive voltage and being connected to the ground.

Kato taught

Additionally, the Applicant is disclosing and claiming that the electrochemical sensor has at least one heating element, which is neither disclosed nor taught by Logothetis.

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ref
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a heating
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between
the
electrodes

Even if one were to combine Logothetis with Kato, the resulting device would be considerably different than what has been disclosed and claimed by the Applicant. For example, one could get an invention with the heating element 30, of Kato between the two electrodes of Logothetis, which is of course very different than what is disclosed and claimed by the Applicant.

Additionally, Claims 2-4, are dependent on Claim 1, and as such are patentable, as claim 1, is clearly patentable.

For the reasons discussed above, withdrawal of the rejection under 35 U.S.C. § 103 (a), with respect to claims 2-4, is hereby respectfully requested.

Rejection under 35 U.S.C. § 103 (a) with respect to claims 1, 7, 8, 10, 12 and 13

Claims 1, 7, 8, 10, 12 and 13 have been rejected under 35 U.S.C. § 103(a), the

Patent Office has contended that these claims are unpatentable over Stahl et al (U.S. Patent No. 4,400,260). It is respectfully submitted that this rejection should be withdrawn for the following reasons.

The earlier discussion with reference to the criteria to be applied in obviousness rulings is incorporated herein by reference since claims 7, 8, 10 and 12 are dependent on claim 1.

Stahl is directed to a shielded, heated electrochemical gas sensor, where a solid electrolyte element 25 separates the first or reference electrode 27 from the second or measuring or sensing electrode 29, with a heating element 30, adjacent to the second or the measuring electrode 29. However, there is no teaching and/or disclosure in Stahl to have the at least one second electrode having a positive voltage and being coupled to the ground, as disclosed and claimed by the Applicant, because in Stahl's Figure 4 the second or measuring electrode 29 is not grounded and there is no suggestion in Stahl to ground the second or the measuring electrode 29.

Similarly, there is no teaching and/or disclosure in Stahl to have the at least one first electrode 12 being negatively polarized and coacting with the at least one second electrode 13, as disclosed and claimed by the Applicant, because in Stahl Figure 5 the first or reference electrode 27 is not coacting with the at least one second or measuring electrode 29 and there is no suggestion in Stahl to have the first or reference electrode 27 is coact with the at least one second or measuring electrode 29. Furthermore, in Stahl's Figure 5, the at least one second or measuring electrode 29 actually coacts with the heating element 30, via the common element 33.

Furthermore, Stahl teaches away from Applicant's invention when in figure 5, and the corresponding text, he teaches that the first or the reference electrode 27 has an independent terminal 34, and that the second electrode 29 be connected to the positive terminal 35, through the heating element 30, which is of course very different than what is disclosed and claimed by Applicant. Applicant is clearly disclosing and claiming that the at least one second electrode having a positive voltage and is coupled to the ground. Similarly, there is no teaching and/or disclosure in Stahl to have the at least one first electrode being negatively polarized and coacting with the at least one second electrode, as disclosed and claimed by Applicant.

Additionally, Claims 7, 8, 10 and 12 are dependent on Claim 1, and as such are patentable, as claim 1, is clearly patentable.

For the reasons discussed above, withdrawal of the rejection under 35 U.S.C. §103 (a), with respect to independent Claims 1, 7, 8, 10, 12 and 13, is hereby respectfully requested.

Rejection under 35 U.S.C. § 103 (a) with respect to claims 1-10, 12 and 13

Claims 1-10, 12 and 13 have been rejected under 35 U.S.C. §103(a), the Patent Office has contended that these claims are unpatentable over Murase et al (U.S. Patent No. 5,413,683). It is respectfully submitted that this rejection should be withdrawn for the following reasons.

The earlier discussion with reference to the criteria to be applied in obviousness rulings is incorporated herein by reference since claims 2-10 and 12 are dependent on claim 1.

Murase teaches an oxygen sensing apparatus 10, and a method using electrochemical oxygen pumping action to provide reference gas, where solid electrolyte layers 12 and 14, with spacer 15, and a gas tight ceramic layer 23, have a first electrochemical cell 28, comprising a measuring electrode 20, and a reference electrode 24, and a second electrochemical cell 36, comprising a first or outer electrode 32, and a second electrode 30, such that the second electrode 30, and the measuring electrode 20, are in the same gas measurement chamber 16. This structure and arrangement is very different than what is disclosed and claimed by Applicant, because in Applicant's invention the at least one second electrode has a positive voltage and is coupled to the ground. Furthermore, there is no teaching and/or disclosure in Murase to have the at least one first electrode being negatively polarized and coacting with the at least one second electrode, as disclosed and claimed by the Applicant.

Furthermore, there is no teaching and/or disclosure in Murase to have the at least one second electrode having a positive voltage and being coupled to the ground, as disclosed and claimed by the Applicant, because in Murase's Figure 1 the reference electrode 24 is not grounded and there is no suggestion in Murase to ground the reference electrode 24.

the voltage
of Murase
is positive
w/ respect
to 32

Similarly, there is no teaching and/or disclosure in Murase to have the at least one first electrode being negatively polarized and coacting with the at least one second electrode, as disclosed and claimed by the Applicant, because in Murase's Figure 1 the measuring electrode 20 is not coacting with the reference electrode 24 and there is no suggestion in Murase to have the measuring electrode 20 to coact with the reference electrode 24.

As a matter of fact, Murase teaches away from Applicant's invention when in Figures 1 and 2, and the corresponding text, he teaches that the measuring electrode 20, and that the second electrode 30, be in the same gas measurement chamber 16, and be exposed to the same gas.

Similarly, Murase teaches away from Applicant's invention when in column 12, lines 32-35, he states that "The oxygen sensing apparatus (10, 50) may be provided with suitable heating means (not shown) as needed for holding the solid electrolyte layers (12, 14, 52) at an appropriate elevated temperature." The heating means could be an external heating means, such as, a furnace. Similarly, to hold all the layers 12, 14 and 52 at the same elevated temperature Murase would have to use either an external heating means or a plurality of internal heating means all linked to provide the appropriate elevated temperature. In any event, the invention of Murase is very different than what is disclosed and claimed by the Applicant. For example, Murase does not disclose and/or teach that the at least one second electrode having a positive voltage and being coupled to the ground. Similarly, there is no teaching and/or disclosure in Murase to have the at least one first electrode being negatively polarized and coacting with the at least one second electrode, as disclosed and claimed by the Applicant.

Additionally, Claims 2-10 and 12 are dependent on Claim 1, and as such are patentable, as claim 1, is clearly patentable.

For the reasons discussed above, withdrawal of the rejection under 35 U.S.C. §103 (a), with respect to claims 1-10, 12 and 13 is hereby respectfully requested.

Rejection under 35 U.S.C. § 103 (a) with respect to claim 11

Claim 11 has been rejected under 35 U.S.C. §103(a), the Patent Office has contended that this claim is unpatentable over Murase et al (U.S. Patent No. 5,413,683)

in view of Kato (U.S. Patent No. 4,909,922). It is respectfully submitted that this rejection should be withdrawn for the following reasons.

The earlier discussion with reference to Murase and Kato in connection with claim 1 is applicable here since claim 11 is dependent on claim 1. Furthermore, the criteria to be applied in obviousness rulings is also incorporated herein by reference.

If one were to combine Murase with Kato as suggested by the Examiner one could have an oxygen sensor 10 of Murase with no gas chamber 16, as taught by Kato and with a heat generating portion 36, embedded in the porous electrolyte layer 22 of Murase, which would be an invention which is different than what is being claimed by the Applicant. Furthermore, the Examiner has not provided any motivation for a person skilled in the art to have an invention where the reference electrode 13 which is in the reference duct 15 and having a positive voltage and is also grounded, as claimed by the Applicant.

Additionally, Claim 11 is dependent on Claim 1, and as such is patentable, as claim 1, is clearly patentable.

For the reasons discussed above, withdrawal of the rejection under 35 U.S.C. §103 (a), with respect to claim 11 is hereby respectfully requested.

Conclusion

It is therefore respectfully submitted that claims 1-13 are allowable. All issues raised by the Examiner having been addressed, an early and favorable action on the merits is earnestly solicited.

The Examiner is urged to allow this case, however, in the event that this case is not allowed the Applicant request that the Examiner enter this Amendment to put the claims in a better condition for Appeal.

The Examiner is also invited to contact the undersigned attorney if any communication is believed to be helpful in advancing the examination of the present application.

Attached hereto is a marked-up version of the changes made to the claims by the current amendment. The attached page is captioned "**Version With Markings To Show Changes Made.**"

Respectfully submitted,

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Date 3/2/01

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Serial No. 09/369,767



VERSION WITH MARKINGS TO SHOW CHANGES MADE

Claims 2,4, 9 and 12 have been amended.

2. (Twice Amended) The sensor according to claim 1, further comprising an arrangement for providing a negative operating voltage so that coupling of a heater voltage is effectively blocked and wherein the negative operating voltage is applied to the negatively polarized electrode.
4. (Twice Amended) The sensor according to claim 2, further comprising a circuit arrangement for analyzing a negative probe voltage (U_s), and wherein the negative operating voltage (U_p) powers the circuit arrangement.
9. (Amended) The sensor according to claim 1, wherein the second electrode is in a reference duct and wherein the reference duct is situated between the at least one first electrode and the at least one heating element.
12. (Amended) The sensor according to claim 1, wherein a portion of the second electrode extends over the width of a reference duct and additionally acts as a shield against any coupling of heater voltage U_H and wherein the reference duct is situated between the at least one first electrode and the at least one heating element.